

TFDS-462E - Thin Film Deposition System



The model **TFDS-462E** thin film deposition system is designed for research, development and low scale production.

Pumping system

The roughing vacuum pump is a dry scroll pump. The high vacuum pump is a turbo-molecular pump with rough vacuum stage for high and ultra-high vacuum application and can pump almost any type of gas. AquaTrap® is an economic means of removing extra water vapor from vacuum chamber. The low profile, compact refrigerator body allows for simple installation on existing systems with minimal design or hardware changes. The vacuum gauges are Convectron® which permits measuring the pressure from atmosphere down to 1×10^{-3} Torr and high vacuum Ionization Bayard-Alpert gauge

Evaporation source

A 6-pockets 4cc crucibles electron beam gun is used for deposition material evaporation. The TT-3 electron beam power supply is a constant-voltage power supply capable of continuously delivering -10.2 kV at 1.5 Amperes as well as filament power for up to three electron beam source. Voltage output is fully adjustable within each range and regulated to within $\pm 1\%$. The programmable sweep enables the user control the position, amplitude, and frequency of electron beam sweep in both the lateral and longitudinal axes. The programmable sweep can thus be used to set up various beam patterns or to place the beam in any stationary position.

Glow discharge

The glow discharge electrode is placed on base plate. Electrode body is aluminum.



Substrate rotation

The substrate holder is driven by brushless DC high torque motor with integrated gear through ferrofluidics rotary feedthrough. Max rotary speed of motor is 28 rpm. The design of substrate rotation permits the use it in three modes:

- continuously mode
- fixed positioning
- adjustable positioning

In the continuously mode the substrate rotary speed may be regulated from 2 to 20 rpm by potentiometer in the front panel of the control unit.

In the fixed positioning mode the substrate is automatically indexed relative to mask hole in any of six sample's place.

In the adjustable positioning mode the substrate may be set in any place using clockwise or counterclockwise slow rotation under visual control.

Shutters

The **TFDS-462E** has two separately controlled shutters: source shutter one electron beam gun and substrate shutter for samples. The shutters configuration allows preheating prior to actual deposition and effective substrate shadowing at the end of deposition. The shutters are automatically controlled. Shutter actuators are mounted in the atmosphere side of the baseplate and pass rotation through o-ring sealed drives. The top bascule type shutter comprise of two half shutters with semi-circular holes in the center. When closed, the holes expose the quartz crystal to the evaporant while masking the substrates. Source shutter plate may be easily be removed for material loading in the electron beam gun, or cleaning / maintenance jobs.

Gas line

The gas line consists of a pneumatically operated shut-off and a metering manual stainless steel, bellow sealed, valves. The metering valve permits to adjust the pressure in the chamber up to 1×10^{-3} Torr.

Thickness film monitor

The SQL-160 is a modern microprocessor controlled instrument for measuring any types of thin-film coating.

Source and substrates viewing

The viewing port is designed to enable direct observation of the substrate holder and indirect viewing of the source crucible, using two adjustable mirrors. The view port glass is protected with a manual shutter. The low voltage quartz lamp helps to observe devices inside the vacuum chamber

Shielding

A set of shielding liners is use to protect the chamber walls against coating. The shielding can be easily removed for cleaning out side the chamber. All shielding liners are made of stainless steel. The lateral is highly polished, while the top is quartz ball blasted to prevent exfoliation of the layers inherently deposit during evaporation. The viewport is protected against coating by removable liner plate

Hoist

Vertical mechanical drive unit, with geared electric motor actuator, fail-safe on power loss, provides the vertical movement of the bell jar. Two switches are used to cut out the electrical drive before the final position is reached. The bell jar chamber can be turned clockwise or counterclockwise when in top position for maintenance by removing fixing screw.

Technical Data

Ultimate pressure:	less than 3×10^{-7} Torr
Pump Down Time:	3×10^{-6} Torr in 40 min
Roughing Vacuum pump:	
Nominal pumping speed:	11.3 m ³ /hrs
Guaranteed ultimate pressure:	7×10^{-2} mbar
Turbo-molecular Vacuum pump:	
Nominal pumping speed, N ₂	280 l/min
Guaranteed ultimate pressure:	1.5×10^{-10} Torr
Chamber:	12" I.D. x 19" H stainless steel cylinder jar, one view port
Top plate:	12" OD x .55 thick, 304 Stainless Steel, five spare holes 1" with blank plug
Base plate:	14" OD x .95 thick 304 stainless steel, NW100 port to pumping station
Valves:	All vacuum valves (roughing, purge and vent) and gate are stainless steel bellow sealed, pneumatic operated.
Evaporation source:	
Model:	241, 6 x 4cc pocket
Power rating	6 kW
Cooling	indirect
Power supply:	
Model:	TT-3
Maximum power:	3 kW
HV (adjustable)	adjustable -4 to -7 kV
Gas Flow:	1 channel. Bellow sealed shut-off and metering valves are stainless steel, manual
Glow discharge	
Max High voltage:	3 kV DC
Max current	300ma
Gauges:	Wide range Vacuum Gauge Controller, 1 convection gauge, 1 ionization gauge Cathode Measuring range 3×10^{-10} to $1.2 \times 10^{+3}$ Torr
Thickness monitor:	SQM-160
Substrate rotation	
Max rotation speed (continuously)	28 rpm
Min rotation speed (continuously)	3 rpm
Number of position (position. mode)	6
Positioning precision	$\pm 2^\circ$
Shutters:	
Number of shutters:	2
Actuator type	pneumatic
Frame:	closed type, aluminum anodizes profiles, painting table, doors and panels, leveling feet
Hoist:	electromechanical type, stroke 480 mm
Weight:	approx.250 Kg